

**TITLE**

METHOD AND APPARATUS FOR EXTENDING A CHIMNEY

**CROSS REFERENCE TO RELATED PUBLICATIONS**

5 This application claims benefit to U.S. Provisional Application Serial No. 60/466,746, filed on May 1, 2003, and U.S. Provisional Application Serial No. 60/483,733, filed on June 30, 2003, both of which are incorporated herein by reference.

10 **FIELD OF INVENTION**

This invention relates to building construction and more specifically to means for improving existing masonry chimneys.

15 **BACKGROUND**

Masonry chimneys have been in use for many years. In many cases, these chimneys require extension. One reason for extending a chimney is performance. The height of a chimney affects its draft capability. If the draft is insufficient, the fire may not burn properly, or smoke may enter the 20 living quarters of the home. The external objects surrounding the chimney, such as trees, rooflines, and other chimneys can also affect performance. These objects may direct wind into the chimney, possibly reducing its draft capability under certain wind conditions. Another reason to extend a chimney is to comply with regional building codes, which often stipulate a minimum height above roofline and other adjacent chimneys. One method of extending a chimney is to extend the masonry 25 bricks, and add additional flue tiles. This is a costly and time-consuming method.

**SUMMARY OF INVENTION**

The present invention provides a flue liner insert having uniquely desirable characteristics. Such an 30 insert can be employed in various methods for extending the length of a chimney. The insert is composed of four pieces, allowing each side of this insert to be independently adjustable. This accommodates the flue tiles, which have a fairly large tolerance, due to the manufacturing process.

For example, there can be variation of two inches or more for a side of a particular instance of a given size of flue tile. In addition to variations in the side length, there are variations in the radius of the inner corners of a given flue tile. The present invention accommodates this variation by using an altered corner. With an altered corner, the flue liner insert does not contact the flue tile in its inner corners. By using altered corners, there is minimal restriction of flow due to the insert. This exploits a principle that smoke does not flow through the entire rectangle bounded by the flue tile, but flows within an oval that is circumscribed in the tile. In using the altered corners, the circumscribed oval is preserved when the insert is in use.

The present invention has the following advantages:

- 10      a) The four-piece design can be disassembled and placed in a compact package for ease of shipping.
- b) Each side of this flue liner insert is independently adjustable, thereby accommodating the variation in side length amongst flue tiles of a stated size.
- 15      c) This flue liner insert employs altered corners, accommodating the variation in radius of the inner corner amongst flue tiles of a stated size.
- d) This flue liner insert minimizes restriction of flow due to the insert.
- e) This flue liner insert distributes the load of the chimney extension over a large portion of the supporting flue tile, rather than only the top edge or lip of the supporting flue tile.
- 20      f) This flue liner insert facilitates easy installation, without need for excessive masonry work.
- g) When designed to accommodate square flue tiles, this flue liner insert is desirably assembled from four identical insert components, minimizing the need to fabricate a multiplicity of different parts.
- h) This flue liner insert serves to line and strengthen the existing chimney by using an appropriate length that fits deep into the chimney.

A first aspect of this invention is a flue liner insert comprising four individual components of sheet material. Each component has a cross section that is generally L-shaped with an altered corner. The components together form a vertical flue passage with each component comprising adjustable fastening means such that each component is independently adjustable in position with respect to the other components.

In a second aspect of this invention, the flue liner insert comprises one or more placement tabs extending at a predetermined height of the flue liner insert.

- 5 In a third aspect of this invention, the upper portion of the flue liner insert has at least one ventilation hole therein.

A fourth aspect of this invention is a method of using a flue liner insert of the third aspect to extend and terminate a chimney having an existing flue tile at its top. Placement tabs are used to position  
10 the flue liner insert at the desired depth within the existing flue tile. A chimney cap is attached to the upper end of the flue liner insert.

A fifth aspect of this invention is a method of using a flue liner insert of the second aspect to extend a chimney having an existing flue tile at its top. Placement tabs are used to position the flue liner  
15 insert at the desired depth within the existing flue tile. An extending flue tile is placed over the flue liner insert such that it is either directly or indirectly supported by the existing flue tile.

A sixth aspect of this invention is a flue liner insert as described in the first aspect, wherein the  
20 adjustable fastening is accomplished using adjustment slots in the individual components. Threaded studs pass through the slots, and a nut is used on each threaded stud to fasten the components.

A seventh aspect of this invention is a flue liner insert as described in the first aspect, having  
threaded holes therein adapted to accommodate bolts that can exert force against the inner wall of a  
25 flue tile.

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An eighth aspect of this invention is a method of using a flue liner insert of the first aspect to extend a chimney having an existing flue tile at its top. The flue liner insert is inserted into an existing flue tile. A metal shroud is placed around the exterior of the flue liner insert and fastened to the flue  
liner insert.

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A ninth aspect of this invention is using the method of the eighth aspect, wherein the flue liner insert has one or more threaded holes, and the metal shroud has one or more holes positioned to correspond to the threaded holes through the flue liner insert. Bolts are used to secure the metal shroud to the flue liner insert.

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A tenth aspect of this invention is a method of using a flue liner insert of the first aspect to extend a chimney having an existing flue tile at its top. The flue liner insert is inserted into an existing flue tile. A chimney pot is placed over the flue liner insert.

10 An eleventh aspect of this invention is using the method of the tenth aspect, wherein the flue liner insert has threaded holes. Bolts are threaded through the holes in the flue liner insert to make contact with and exert force against the chimney pot. This serves to secure the chimney pot over the flue liner insert.

15 A twelfth aspect of this invention is a method of using a flue liner insert of the first aspect to extend a chimney having an existing flue tile at its top. The flue liner insert is inserted into an existing flue tile. A metal shroud is placed around the exterior of the flue liner insert. An insulating material is inserted between the exterior of the flue liner and the interior of the metal shroud. The metal shroud is fastened to the flue liner insert.

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A thirteenth aspect of this invention is a flue liner insert of the first aspect, wherein the altered corner is a beveled corner.

25 A fourteenth aspect of this invention is a flue liner insert of the first aspect, wherein the altered corner is an inverted corner.

A fifteenth aspect of this invention is a flue liner insert of the first aspect, wherein the altered corner is an outwardly rounded corner.

30 A sixteenth aspect of this invention is a flue liner insert of the first aspect, wherein the altered corner is an inwardly rounded corner.

A seventeenth aspect of this invention is a flue liner insert of the first aspect, further comprising an adjustable expansion mechanism.

## BRIEF DESCRIPTION OF DRAWINGS

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Fig. 1A shows an individual insert component for assembling with other components into a flue liner insert of the present invention.

10 Fig. 1B shows an individual insert component with an offset, to be used for assembling with other components into a flue liner insert of the present invention.

Fig. 1C shows a top view of an individual insert component with an offset, to be used for assembling with other components into a flue liner insert of the present invention.

15 Fig. 2 shows four individual components assembled to form a flue liner insert of the present invention, which is shown inserted into a flue tile. This figure also shows the optional placement tabs, which help place the insert at a pre-determined depth into the existing chimney.

Fig. 3 shows a flue liner insert similar to the insert shown in Fig. 2, joining two flue tiles.

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Fig. 4 shows a flue liner insert similar to the insert shown in Fig. 2 with ventilation holes, thereby forming a chimney termination device.

25 Fig. 5 shows a flue liner insert similar to the insert shown in Fig. 2 supporting a sheet metal decorative shroud.

Fig. 6 shows a flue liner insert similar to the insert shown in Fig. 2, supporting a decorative clay chimney pot with an integrated flue tile.

30 Figs. 7A - 7D show various embodiments of an altered corner.

Fig. 8 shows a flue liner insert similar to the insert shown in Fig. 2, supporting a decorative clay chimney pot that fits over an existing flue tile.

5 Fig. 9 shows an embodiment with insulation placed between the flue liner insert and the metal shroud.

Fig. 10 shows an embodiment with an adjustable expansion mechanism to facilitate the fitting of the flue insert tightly against the flue tile walls.

10 **DETAILED DESCRIPTION**

Fig. 1A shows an embodiment of an individual component **100** of a flue liner insert in accordance with the invention. Each component comprises a wall portion **110** connected to a corner piece **130** at an angle. A second wall portion **120** is connected at the opposite side of the corner piece **130** at 15 an angle, resulting in wall portion **110** being approximately perpendicular to wall portion **120**. The outermost part of wall portion **110** has one or more adjustment slots **150**. Wall portion **120** contains one or more threaded studs **170**, with the same alignment and spacing as the adjustment slots **150**. Optionally, holes to accommodate separate bolts can be used in place of threaded studs (not shown). The individual component may optionally contain threaded holes **160** for the purpose of 20 accommodating bolts that make contact with a flue tile. The threaded holes **160**, while shown in a wall portion, may also reside in the corner piece **130**, as shown in Fig. 2. The component **100** is desirably fabricated of a single sheet of metal.

25 Fig. 1B shows an individual component **140** which has an offset **145**. The offset **145** allows the individual components to fit together forming a straight exterior wall, which maximizes the volume of the flue liner insert.

30 Fig. 1C shows a top view of the individual component **140** of Fig 1B. The offset **145** allows the individual components to fit together forming a straight exterior wall, which maximizes the volume of the flue liner insert.

- Fig. 2 shows a flue liner insert **280** assembled from four individual components **100**. The threaded studs **170** of one individual component **100** penetrate the adjustment slots **150** of the adjacent individual component **100**. Desirably, nuts **180** may secure the individual components to each other by being tightened onto the threaded studs **170**. In the embodiment shown, wing nuts are used,
- 5 which allow fastening by hand. Those skilled in the art will recognize that other fastening means are possible. As it is being assembled, the flue liner insert is adjusted to fit snugly into the existing flue tile **220**. Optionally, bolts **200** may be threaded through threaded holes **160** to provide additional friction when inserted in the existing flue tile **220**.
- 10 An alternative embodiment of the invention as shown in Fig. 2 includes a placement tab **210** attached to the flue liner insert **280**. In one exemplary embodiment, the placement tab **210** is attached to each corner of the flue liner insert **280**. Those skilled in the art will recognize that other locations are possible. The placement tab **210** limits the depth that the flue liner insert **280** may be inserted into the existing flue tile **220**.
- 15 Fig. 3 shows the use of the flue liner insert to facilitate adding an additional flue tile to a chimney. This method involves inserting the flue liner insert **280** into the existing flue tile **220**, optionally using one or more placement tabs **210** to ensure that a predetermined portion of the flue liner insert is inserted into the existing flue tile. Next, an extending flue tile **230** is placed onto the portion of
- 20 the insert that protrudes from the existing flue tile. The extending flue tile **230** fits over the flue liner insert **280** and is supported by the existing flue tile **220**. In this way, the extending flue tile **230** serves to extend the chimney without the need for extensive masonry work.
- 25 Fig. 4 shows another embodiment of a chimney termination device in accordance with this invention. Here, the termination device is a chimney cap **240**. Placement tabs **210** may be used to help place the flue liner insert into the existing flue tile **220** at a pre-determined depth. In this embodiment, the upper portion of the flue liner insert **280** is vented by means of adding a plurality of ventilation holes **190**. Those skilled in the art will recognize that other shaped holes are possible for the purposes of ventilation. In another embodiment, an open area can be used in place of
- 30 ventilation holes. Ventilation may also be facilitated using a screen material in place of, or in combination with the ventilation holes **190**.

Fig. 5 shows a metal shroud 250 that covers the flue liner insert 280. In an exemplary embodiment, L-shaped brackets 260 fasten the metal shroud 250 to the flue liner insert 280. Those skilled in the art will recognize that other means of fastening the metal shroud 250 to the flue liner insert 280 are possible. The metal shroud 250 can serve to further protect the flue liner insert 280, and also provides a decorative element for the chimney.

Fig. 6 shows an integrated clay chimney pot 270, which has an integrated flue tile, attached using a flue liner insert 280. The integrated clay chimney pot 270 can serve to further protect the flue liner insert 280, and also serves as a decorative element for the chimney.

Figs. 7A – 7D show various embodiments of an altered corner.

Fig. 7A shows an individual component with a beveled corner piece 130.

Fig. 7B shows an individual component with an inverted corner 290 formed by two perpendicular intersecting flanges.

Fig. 7C shows an individual component with an outwardly rounded corner 300.

Fig. 7D shows an individual component with an inwardly rounded corner 310.

Those skilled in the art will recognize that other variations of altered corners may be possible, but they will function in the same manner as the embodiments mentioned herein.

Fig. 8 shows a fit-over clay chimney pot 320 that fits over an existing flue tile 220. To provide additional support, bolts 200 may be threaded through threaded holes 160 in the flue liner insert 280 to make contact with the fit-over chimney pot 320.

Fig. 9 shows an embodiment with insulation placed between the flue liner insert 280 and the metal shroud 250. The insulation 255 surrounds the flue liner insert 280, and serves to keep flue gases warm, which increases draft and reduces condensation in the chimney. The insulation 255 also reduces the temperature of the outer surface of the metal shroud 250, thereby serving to reduce the risk of a chimney fire. In one embodiment, the type of insulation used is flexible vitreous fiber, which is readily available from multiple vendors.

Fig 10 shows an embodiment with an adjustable expansion mechanism 360 to facilitate the fitting of the flue insert tightly against the flue tile walls. The embodiment shown consists of a machine screw 330 that is threaded through a threaded bracket 340 on a first individual component 370 and makes contact with a solid bracket 350 on a second individual component 380. Those skilled in the art will recognize that other variations of an adjustable expansion mechanism, including cams and wedges, may be possible, but they will serve the same purpose as the embodiment mentioned herein.

## 10 OPERATION

To modify a chimney in accordance with the present invention, a user first measures the sides of the particular flue tile of the chimney that is to be extended. Optionally, placement tabs 210 can help the user determine how far into the existing flue tile the flue liner insert 280 is to be inserted. The four sides of the flue liner insert are placed against the inner walls of the flue tile. In an optional embodiment, the individual flue liner insert components 100 may have line markings to assist the user in setting the flue liner insert to the proper size for the given flue tile.

To provide additional friction between the flue liner insert and the existing flue tile 220 or extending flue tile 230, bolts 200 are desirably inserted into threaded holes 160 such that the ends of the bolts 200 protrude through the flue liner insert 280 to contact the flue tile.

The portion of the flue liner insert that protrudes from the existing flue tile may be covered with a sheet metal shroud 250 for decorative and insulating purposes. Optionally, an insulating material may be placed between the flue liner insert and the metal shroud 250.

The flue liner insert can be used with two types of chimney pots; integrated chimney pots, and fit-over chimney pots. The integrated chimney pot has an interior with dimensions similar to that of a flue tile. The fit-over chimney pot has an interior with dimensions larger than that of a flue tile.

In another embodiment, a fit-over clay chimney pot 320 may be placed over the portion of the flue liner insert that protrudes from the existing flue tile for decorative and insulating purposes. To provide additional support, bolts 200 may be threaded through threaded holes 160 to make contact with the fit-over chimney pot 320. Optionally, an insulating material may be placed between the

5 flue liner insert and the fit-over clay chimney pot 320.

In an alternative embodiment, the flue liner insert 280 can be used to join two flue tiles together, as shown in Fig. 3.

10 In another embodiment, the flue liner insert 280 may function as a chimney termination device, such as a chimney cap 240, or serve for mounting of same. Furthermore, the flue liner insert 280 may serve as a mounting bracket onto which other assemblies can be mounted.

15 In another embodiment, the flue liner insert is part of a chimney assembly comprised of; the flue liner insert 280, a metal shroud 250, and insulation 255 between the metal shroud 250 and the flue liner insert 280.

In another embodiment, the flue liner insert may be equipped with an adjustable expansion mechanism 360 to facilitate the fitting of the flue insert tightly against the flue tile walls.

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## CONCLUSION

Accordingly, the reader will see that the flue liner insert of this invention can be used to quickly and economically extend a chimney to improve performance, and meet regional building codes. In  
25 addition, the four piece design accommodates the wide fluctuation found in flue tiles of a given size. The configuration of the insert of the present invention allows it to be shipped in an unassembled state to facilitate a compact package for ease of distribution.

Although the description above contains specific details, these should not be construed as limiting  
30 the scope of the invention, but as merely providing illustrations of some of the presently preferred

embodiments of this invention. The scope of the invention should be determined by the appended claims and their legal equivalents, rather than by the examples given.